Claims

[c1] 1. A photolithographic process that involves building a sandwich photoresist structure, comprising the steps of:providing a substrate;forming a first photoresist layer over the substrate;forming a non-photosensitive material layer over the first photoresist layer; forming a second photoresist layer over the non-photosensitive material layer;conducting a first photo-exposure of the second photoresist layer; conducting a first photoresist development to pattern the second photoresist layer and the non-photosensitive material layer; and conducting a second photo-exposure and a second photoresist development to pattern the first photoresist layer using the second photoresist layer and the non-photosensitive material layer as a mask.

2. The photolithographic process of claim 1, wherein the non-photosensitive material layer is formed from a material that can be dissolved by the chemical developer used in the first photoresist development.

3. The photolithographic process of claim 1, wherein the non-photosensitive material layer includes an anti-reflection layer.

4. The photolithographic process of claim 1, wherein material constituting the anti-reflection layer includes addition polymerization polymer, condensation polymerization polymer, or ring-opening polymerization polymer.

5. The photolithographic process of claim 1, wherein the non-photosensitive material layer has a thickness between about 300 Å to 1000 Å .

6. The photolithographic process of claim 1, wherein the first photoresist layer is a positive photoresist layer.

7. The photolithographic process of claim 1, wherein the first photoresist layer has a thickness between about 2000 Å to 7000 Å .

8. The photolithographic process of claim 1, wherein the second photoresist layer is a positive photoresist layer or a negative photoresist layer.

9. The photolithographic process of claim 1, wherein the second photoresist layer has a thickness between about 1000 Å to 3000 Å .

10. A method of forming the self-aligned dual damascene opening of a dual damascene structure, comprising the steps of:providing a substrate having a dielectric layer thereon;forming a first photoresist layer over the dielectric layer;forming a non-photosensitive material layer over the first photoresist

layer; forming a second photoresist layer over the non-photosensitive material layer;conducting a first photo-exposure of the second photoresist layer; conducting a first photoresist development to pattern the second photoresist layer and the non-photosensitive material layer and form a trench; conducting a second photo-exposure of the first photoresist layer; conducting a second photoresist development to pattern the first photoresist layer and form a via opening underneath the trench, wherein the trench and the via opening together constitute a dual damascene opening pattern; and conducting an etching operation to transfer the dual damascene opening pattern to the dielectric layer, thereby forming a dual damascene opening in the dielectric layer.

11. The method of claim 10, wherein the non-photosensitive material layer is formed from a material that can be dissolved by the chemical developer used in the first photoresist development.

12. The method of claim 10, wherein the non-photosensitive material layer includes an anti-reflection layer.

13. The method of claim 12, wherein material constituting the anti-reflection layer includes addition polymerization polymer, condensation polymerization polymer, or ring-opening polymerization polymer.

14. The method of claim 10, wherein the non-photosensitive material layer has a thickness between about 300 Å to 1000 Å .

15. The method of claim 10, wherein the first photoresist layer is a positive photoresist layer.

16. The method of claim 10, wherein the first photoresist layer has a thickness between about 2000 Å to 4000 Å .

17. The method of claim 10, wherein the second photoresist layer is a negative photoresist layer.

18. The method of claim 10, wherein the second photoresist layer has a thickness between about 2000 Å to 4000 Å .

19. A photolithographic process, comprising the steps of:providing a substrate;forming a positive photoresist layer over the substrate; forming a non-photosensitive material layer over the positive photoresist layer; forming a negative photoresist layer over the non-photosensitive material layer;

conducting a first photo-exposure of the negative photoresist layer; conducting a first photoresist development to pattern the negative photoresist layer and the non-photosensitive material layer and form a first pattern; conducting a second photo-exposure of the positive photoresist layer; and conducting a second photoresist development to pattern the positive photoresist layer and form a second pattern.

20. The photolithographic process of claim 19, wherein the non-photosensitive material layer is formed from a material that can be dissolved by the chemical developer used in the first photoresist development.

21. The photolithographic process of claim 19, wherein the non-photosensitive material layer includes an anti-reflection layer.

22. The photolithographic process of claim 21, wherein material constituting the anti-reflection layer includes addition polymerization polymer, condensation polymerization polymer, or ring-opening polymerization polymer.

23. The photolithographic process of claim 19, wherein the non-photosensitive material layer has a thickness between about 300 Å to 1000 Å .